1944

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Louisiana Bulletin No. 373 March, 1944

FINANCIAL RESULTS OF THE OPERATION OF SUGAR MILLS IN LOUISIANA 1939, 1940 AND 1941

by

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INTRODUCTION

A detailed study of the costs and returns from the operations of sugar mills in Louisiana was begun with the 1937 crop year. A previous publication contains a report covering the years 1937 and 1938.[1] The purpose of this report is to present information for the years 1939, 1940 and 1941 and to make comparisons of significant trends for the period. In each of the years the study was limited to mills which manufactured primarily raw sugar. Also the general methods of collecting and analyzing the information were the same each year. Records were collected from 42 mills in 1939, 38 in 1940, and 36 in 1941. There were between 45 and 50 mills in the state each year which manufactured primarily raw sugar. Consequently the sample represents a large proportion of the industry.

The total costs of operating the mills were divided into five main groups, and each group was subdivided into various items.[2] These groupings were very largely determined by the customary practices of the mills in keeping their accounts. However, since these practices varied somewhat between mills, it was necessary to make certain adjustments in the accounts of some of the mills in order to fit them into the arrangement used in this study. Whenever the mills obtained cane from land operated by the company operating the mill, the cost of the cane to the mill was considered to be the amount which would have been paid if the cane had been produced by independent operators. Most of the mills kept their records so as to show the costs in this manner. In cases where they did not do so, appropriate adjustments were made in the records obtained.

The interest cost was calculated at 5 per cent of the total value of the assets used in the business. Interest actually paid for the use of borrowed funds was not included as a cost. This procedure placed all mills on the same basis with respect to capital charges, regardless of the extent of

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[1] Bulletin No. 316 Louisiana Agricultural Experiment Station.

[2] A detailed description of the items included in each group of costs and of the methods of calculating net income is given in Bulletin No. 316 Louisiana Agricultural Experiment Stations, pp. 3 to 5.

TABLE 1. Costs and Returns From the Operation of Sugar Mills in Louisiana, Average Per Mill, Per Ton of Cane Ground, And Per 100 Pounds of Sugar Manufactured, 1939, 1940 and 1941.

Items of cost and return	Average per mill			Average per ton of cane			Average per 100 lbs. of sugar		
	1939	1940	1941	1939	1940	1941	1939	1940	1941
General overhead									
Labor	12,423.94	8,708.02	10,995.28	.16	.20	.18	.10	.12	.11
Materials	1,404.45	888.84	462.23	.02	.02	.01	.01	.01	.01
Taxes	4,421.68	4,121.00	4,846.69	.07	.09	.08	.03	.06	.05
Insurance	5,978.90	4,636.26	6,745.61	.08	.10	.11	.05	.06	.06
Depreciation	14,708.10	14,228.15	14,989.84	.20	.32	.24	.11	.20	.14
Other	2,061.14	2,667.97	3,519.12	.03	.06	.05	.02	.04	.03
Total	40,998.21	35,250.24	41,558.77	.56	.79	.67	.32	.49	.40
Procurement of cane									
Labor	4,134.01	2,297.29	6,749.71	.08	.05	.11	.03	.03	.06
Transportation	24,801.94	13,301.57	17,640.31	.33	.29	.28	.20	.18	.17
Cane purchased	206,303.28	122,779.40	219,760.59	2.78	2.76	3.52	1.59	1.69	2.10
Other	1,142.69	1,159.21	13,335.95	.01	.04	.21	.01	.02	.13
Total	236,381.92	139,537.47	257,486.56	3.20	3.14	4.12	1.83	1.92	2.46
Manufacture of sugar									
Labor	26,201.28	19,922.78	35,554.56	.35	.45	.57	.23	.27	.34
Fuel	6,378.56	5,134.58	5,917.54	.08	.12	.10	.05	.07	.06
Lime, sulphur, etc	1,526.53	697.87	1,064.22	.02	.02	.02	.01	.01	.01
Bags and twine	5,338.07	3,899.92	4,540.07	.07	.09	.07	.04	.05	.04
Laboratory supplies	409.99	456.18	264.48	.01	.01	*	.01	.01	*
Other supplies	2,552.08	2,105.92	2,219.88	.03	.05	.04	.02	.03	.02
Repairs—labor	10,836.31	9,865.79	4,729.37	.15	.22	.08	.08	.14	.05
Repairs—material	12,136.56	11,010.10	7,774.13	.16	.24	.12	.09	.15	.07
Other	2,858.80	1,946.71	6,548.04	.05	.04	.10	.02	.03	.06
Total	68,238.18	55,039.85	68,612.29	.92	1.24	1.10	.52	.76	.65

*Less than 0.005.

TABLE 1. *(Continued)* COSTS AND RETURNS FROM THE OPERATION OF SUGAR MILLS IN LOUISIANA, AVERAGE PER TON OF CANE GROUND, AND PER 100 POUNDS OF SUGAR MANUFACTURED, 1939, 1940 AND 1941.

ITEMS OF COST AND RETURN	AVERAGE PER MILL			AVERAGE PER TON OF CANE			AVERAGE PER 100 LBS. OF SUGAR		
	1939	1940	1941	1939	1940	1941	1939	1940	1941
Selling									
Commission	4,205.99	1,866.13	2,767.25	.06	.04	.04	.03	.03	.03
Weighing and gauging	974.63	260.74	387.44	.01	.01	.01	.01	*	*
Storage	1,189.76	672.32	172.93	.01	.02	*	.01	.01	*
Freight and drayage	11,839.59	4,629.50	4,989.98	.16	.10	.08	.09	.06	.05
Other	988.36	516.55	1,149.07	.01	.01	.02	.01	.01	.01
TOTAL	19,208.33	7,945.24	9,466.67	.25	.18	.15	.15	.11	.09
Interest	16,492.90	17,549.65	20,017.98	.22	.39	.32	.13	.24	.19
TOTAL COST	381,319.54	255,322.45	397,142.27	5.15	5.74	6.36	2.95	3.52	3.79
Miscellaneous credits	33,404.10	25,266.64	109,200.55	.45	.57	1.75	.26	.35	1.04
Net cost	347,915.44	230,095.81	287,941.72	4.70	5.17	4.61	2.69	3.17	2.75
Receipts									
Raw sugar	371,306.53	214,181.31	331,896.60	5.01	4.82	5.31	2.87	2.95	3.17
Miscellaneous receipts									
Other sugar	3,730.27	755.00	32,629.67	.05	.02	.52	.03	.01	.31
Syrup	1,524.34	3,217.26	7,336.44	.02	.07	.12	.01	.04	.07
Molasses	23,031.18	17,243.78	61,734.24	.31	.39	.99	.18	.24	.59
Other	5,118.31	4,010.60	7,500.20	.07	.09	.12	.04	.06	.07
TOTAL MISCELLANEOUS	33,404.10	25,226.64	109,200.55	.45	.57	1.75	.26	.35	1.04
Total receipts	404,710.63	239,407.95	441,097.15	5.46	5.39	7.06	3.13	3.30	4.21
Operating expenses	364,826.70	237,772.80	377,124.29	4.93	5.35	6.04	2.82	3.28	3.60
Net operating income	39,883.93	1,635.15	63,972.86	.53	.04	1.02	.31	.02	.61
Net income	23,391.09	−15,914.50	43,954.88	.31	−.35	.70	.18	−.22	.42
Capital investment	329,856.85	350,993.08	406,470.77	4.46	7.89	6.51	2.55	4.83	3.88
Cane ground—mill tons	74,028.40	44,447.40	62,455.94	.....	.....	.....	.57	.61	.60
Sugar made—pounds	12,792,355.00	7,267,582.00	10,487,408.00	174.49	163.51	167.90	.....	.....	.....

*Less than 0.005.

their borrowings or the rate of interest actually paid. The use of 5 per cent in calculating interest was largely arbitrary. The effect of using a different rate can be determined by applying the desired rate to the capital investment given in the tables.

Average Costs and Returns

The average financial results of the operation of the mills in 1939, 1940 and 1941 are shown in Table 1. In general the three years were very different. In 1939 and 1941 the average net income of the mills was satisfactory, while in 1940 serious losses were suffered. Apparently the most important reasons for this marked difference were the smaller number of tons of cane ground and the lower yield of sugar per ton of cane in 1940. The number of tons of cane ground per mill was approximately 35 per cent lower in 1940 than the average of 1939 and 1941. The number of pounds of sugar manufactured was nearly 38 per cent lower. No doubt other factors, such as changes in wage rates and the prices of materials used by the mills, had some influence on the difference in the results obtained in each year, but their effect was of minor importance only.

The effect of reduced volumes on costs was quite different for some items than it was for others. The average total cost per mill was $133,-908.45 or 34 per cent lower in 1940 than the average of 1939 and 1941. Interest costs increased slightly each year. General overhead costs were only 15 per cent and the costs of manufacturing sugar 20 per cent lower in 1940 than the average of the other two years. In contrast to this, procurement costs declined 43 per cent and selling costs 45 per cent. In other words some of the costs remained at approximately the same amount per mill in spite of the decreased volume of product handled, while other costs declined in about the same proportion as the decline in volume. In particular such costs as interest, depreciation, repairs, insurance, and taxes are relatively fixed in amount regardless of yearly variations in the volume of business. Certain other costs, such as the purchase of cane and charges for selling sugar, are largely set at certain amounts per unit of raw material or finished product and consequently vary closely with variations in volume. Selling costs per mill declined even more than volume did from 1939 to 1940. Apparently this was caused by certain changes in selling practices made by some of the mills.

The costs of operating sugar mills can be measured in terms of cost per unit of business done. Table 1 shows such costs in two ways; one as average cost per ton of cane ground and the other as average per 100 pounds of sugar manufactured. The relative behavior of these unit costs in the years studied was quite different from the behavior of average costs per mill. The total cost per ton of cane ground was approximately the same in 1940 as the average of the other two years while cost per 100 pounds of sugar was 4 per cent higher. Increases in unit costs in 1940 occurred in general overhead, manufacture of sugar and interest.

Selling costs per unit actually declined, while the unit costs of procuring cane were highest in 1941. The high costs in 1940 were largely caused by the fixed costs which could not be reduced in amount when the volume of business of the mills declined.

The average gross receipts per mill declined 41 per cent from 1939 to 1940 but were 9 per cent higher in 1941 than in 1939. The decline in 1940 was entirely the result of a decline in the volume of product handled, since the gross income per ton declined only 1.3 per cent from 1939 to 1940, while the income per 100 pounds of sugar increased 5.4 per cent. The prices obtained for sugar and other prdoucts sold by the mills were, in general, slightly better in 1940 than in the previous year. They were still higher in 1941. The greatest increase in prices occurred in the price of molasses in 1941.

Geographic Variations

It is commonly recognized that there are important differences in the conditions under which sugar mills operate in various parts of the sugar producing area of Louisiana. In an attempt to study the effect of these differences on financial returns, the mills were divided into two groups. One group, in what is called the Teche region, includes all of the mills located west of the Atchafalaya River. The other group, in the Mississippi region, includes all of the mills east of the Atchafalaya River. Not all of the important geographic differences are revealed by this division. However, the number of mills included in the study is so small that it is not feasible to use smaller regions.

The total cost per 100 pounds of sugar manufactured was lower in the Teche than in the Mississippi region in 1939 and 1940, but it was higher in 1941 (Table 2). Most of the differences in costs were not large. In 1939 and 1940 the most important differences were in the cost of manufacturing sugar and in 1941 in the cost of cane to the mills.

The receipts of the mills from the sale of sugar and from other sources were practically the same for both regions in 1939. In 1940 the receipts of the Teche mills, per 100 pounds of sugar manufactured, were slightly larger than they were in the Mississippi region, while in 1941 they were lower. The greatest difference in 1941 was in receipts from miscellaneous sources. Receipts from the sale of molasses account for the larger part of the miscellaneous receipts.

Both net operating income and net income were higher, or losses lower, in 1939 and 1940 for mills in the Teche region than they were for those in the Mississippi region. In 1941 the situation was reversed and the mills in the Mississippi region obtained the largest net income. The reasons for the shift in 1941 are not entirely clear. In each of the three years the average yield of sugar per ton of cane ground was higher in the Teche than in the Mississippi region. Also the capital invested, per 100 pounds of sugar manufactured, was slightly lower each year in the Teche than in the Mississippi region.

TABLE 2. GEOGRAPHIC VARIATIONS IN THE FINANCIAL RESULTS OBTAINED FROM THE OPERATION OF SUGAR MILLS IN LOUISIANA, 1939, 1940, AND 1941.

ITEMS OF COST AND RETURN	AVERAGE PER 100 POUNDS OF SUGAR MANUFACTURED					
	1939		1940		1941	
	Miss. region	Teche region	Miss. region	Teche region	Miss. region	Teche region
General overhead	$ .32	$ .31	$ .51	$ .46	$ .39	$ .40
Procurement of cane	1.84	1.82	1.93	1.91	2.41	2.52
Manufacture of sugar	.58	.48	.77	.74	.65	.66
Selling	.16	.14	.11	.11	.08	.10
Interest	.14	.12	.24	.24	.20	.18
TOTAL COST	3.04	2.87	3.56	3.46	3.73	3.86
Miscellaneous credits	.26	.26	.36	.33	1.32	.72
Net cost	2.78	2.61	3.20	3.13	2.41	3.14
Receipts from:						
Raw sugar	2.88	2.87	2.90	3.00	3.03	3.32
Miscellaneous sources	.26	.26	.36	.33	1.32	.72
TOTAL	3.14	3.13	3.26	3.33	4.35	4.04
Operating expenses	2.90	2.75	3.32	3.22	3.53	3.68
Net operating income	.24	.38	−.06	.11	.82	.36
Net income	.10	.26	−.30	−.13	.62	.18
Capital investment	2.84	2.31	4.94	4.71	4.07	3.64
Pounds of sugar produced per ton of cane ground	170.90	177.70	159.50	168.10	164.90	171.60

Relation of Size of Mills to Financial Results

The relationship between the size or capacity of a sugar mill and the financial results that might be obtained from its operation is one of great importance to the industry. There has been a tendency, over a long period of years, for the number of sugar mills in Louisiana to decrease and for their average size to increase. Technical progress in the manufacture of sugar seems to have been largely responsible for this trend. The data collected in this study are helpful in obtaining an understanding of the significance of size in relation to financial returns, although many factors other than those considered in this study are of importance in this connection.

Table 3 shows, for each of the three years, the relationship between the capacity of the mills, in tons of cane which could be ground per 24 hours, and the costs of operating the mills per 100 pounds of raw sugar manufactured. In 1939 and 1941 the costs decreased as the capacity of the mills increased. The decline was largest in 1941 when the average net income of all of the mills was highest. In 1940, when the average mill

lost money, the costs were actually higher for the mills with the largest capacity than they were for the smallest mills. The greatly reduced tonnage of cane ground in 1940 apparently had more adverse effect on the large mills than it did on the small ones. Interest and overhead costs are largely fixed in amount per mill regardless of yearly variations in the size of the crop. Since the tonnage ground declined more in 1940 for the large mills than it did for the small ones, the fixed costs per 100 pounds of sugar made tended to increase more. This appears to be the explanation of the reverse relationship between capacity and unit costs existing in 1940.

TABLE 3. Relation Between the Capacity of Sugar Mills and the Cost, Per 100 Pounds, of Operating Raw Sugar Mills in Louisiana, 1939, 1940 and 1941

Capacity of mills in tons per 24 hours	Number of mills	Costs per 100 pounds of raw sugar					
		Total Cost	General overhead	Procurement of cane	Manufacture of sugar	Selling	Interest
1939—Under 1000...	9	$ 3.00	$ .28	$ 1.86	$ .57	$ .19	$ .10
1,000 to 1,499.	18	3.06	.33	1.86	.57	.17	.14
1,500 and over	15	2.88	.32	1.82	.50	.12	.12
All mills..	42	2.95	.32	1.83	.52	.15	.13
1940—Under 1,000..	6	3.40	.46	1.86	.75	.18	.15
1,000 to 1,499.	17	3.60	.52	1.90	.83	.11	.24
1,500 and over	15	3.48	.47	1.94	.71	.10	.26
All mills..	38	3.52	.49	1.92	.76	.11	.24
1941—Under 1,000..	8	3.98	.35	2.68	.71	.12	.12
1,000 to 1,499.	12	3.93	.38	2.55	.67	.11	.22
1,500 and over	16	3.68	.41	2.36	.64	.07	.20
All mills..	36	3.79	.40	2.46	.65	.09	.19

The principal advantage of the large mills in obtaining lower costs appears to have been in connection with the costs of manufacture and selling expenses. Each year, including even 1940, these costs were lower for the large mills than they were for the small ones. In 1939 manufacturing costs were 12 per cent lower for the large than for the small mills. In 1940 the difference was 5 per cent and in 1941 it was 10 per cent. The decline in selling costs amounted to 37 per cent in 1939, 44 per cent in 1940, and 42 per cent in 1941. Interest and overhead costs were generally higher for large mills than they were for small ones.

The relationship between the capacity of sugar mills and the income received per 100 pounds of sugar manufactured is shown in Table 4. In general there was no consistent relationship between the total receipts of the mills and their capacity. However, both the net income and the net operating income per 100 pounds of sugar were greater for the large

mills than for the small ones in 1939 and 1941. In 1940 the mills with the smallest capacity had better net incomes than any of the other groups. The same factors that influenced the relationship of size to cost also appear to have been responsible for the relationship between size and net income.

TABLE 4. Relation Between the Capacity of Sugar Mills and the Income, Per 100 Pounds, From the Operation of Raw Sugar Mills in Louisiana, 1939, 1940, and 1941.

Capacity of mills in tons per 24 hours	Number of mills	Income per 100 pounds of raw sugar				
		Total receipts	Receipts from sugar	Other receipts	Net operating income	Net income
1939—Under 1,000	9	$ 3.16	$ 2.91	$ .25	$ .27	$ .17
1,000 to 1,499	18	3.15	2.90	.25	.23	.09
1,500 and over	15	3.11	2.85	.26	.35	.23
All mills	42	3.13	2.87	.26	.31	.18
1940—Under 1,000	6	3.45	3.10	.35	.20	.05
1,000 to 1,499	17	3.21	2.90	.31	−.15	−.39
1,500 and over	15	3.32	2.95	.37	.10	−.16
All mills	38	3.30	2.95	.35	.02	−.22
1941—Under 1,000	8	4.32	3.27	1.05	.46	.34
1,000 to 1,499	12	4.41	3.51	.90	.70	.48
1,500 and over	16	4.08	2.98	1.11	.60	.40
All mills	36	4.21	3.17	1.04	.61	.42

Part of the decreased costs and increased net income can be attributed to the greater technical efficiency which the larger mills apparently possessed. For instance, Table 5 shows that the number of pounds of sugar manufactured per ton of cane increased as the size of the mills increased in both 1939 and 1941. In 1940 it decreased slightly. The reason for the lower recovery of sugar by the large mills in 1940 is not clear. The quality of the cane, as indicated by the percent of sucrose it contained was about the same each year for the various sizes of mills.

The percentage of the sucrose originally present in the cane which was recovered in sugar was slightly greater for the large than for the small mills in 1939 and 1941 and slightly smaller in 1940. The difference was greatest in 1939 when the quality of the cane ground was apparently somewhat better than in the other two years and the recovery of sugar per ton of cane was the largest for the three-year period.

Relation of Volume of Cane Ground to Financial Results

The number of tons of cane ground by a sugar mill in any season is, of course, closely related to the size of the mill. However, the rela-

TABLE 5. Relation Between the Capacity of Louisiana Sugar Mills and Their Average Volume of Business and Technical Efficiency, 1939, 1940, and 1941.

Capacity of Mills in tons per 24 hours	Number of mills	Pounds of raw sugar made	Tons of cane ground	Pounds of sugar per ton cane	Days of capacity grinding	Per cent sucrose in cane	Per cent of sucrose recovered in sugar
1939—Under 1,000....	9	6,936,474	40,949	169.4	54.2	10.6	75.9
1,000 to 1,499...	18	11,783,435	67,918	173.5	58.6	10.3	79.7
1,500 and over..	15	17,866,364	101,208	176.5	54.8	10.3	80.8
All mills...	42	12,917,332	74,028	174.5	56.2	10.4	79.7
1940—Under 1,000....	4	3,865,152	23,632	163.6	27.8	9.1	81.5
1,000 to 1,499...	13	5,857,462	35,817	163.5	31.1	10.0	78.4
1,500 and over..	15	10,001,203	61,485	162.7	33.2	9.8	78.9
All mills...	32	7,500,848	35,296	163.0	32.1	9.8	78.9
1941—Under 1,000....	8	5,991,402	36,346	164.8	46.1	10.1	79.8
1,000 to 1,499...	12	8,812,011	52,466	168.0	43.8	9.4	81.3
1,500 and over..	16	13,991,958	83,003	168.6	45.3	10.0	81.0
All mills...	36	10,487,407	62,456	167.9	45.0	9.9	80.9

tionship is by no means perfect, since some mills operate at more nearly maximum capacity or for a greater number of days than do others. Table 6 shows the relationship between the number of tons of cane ground

TABLE 6. Relation Between the Volume of Cane Ground and the Average Costs Per 100 Pounds of Raw Sugar Manufactured by Louisiana Mills, 1939, 1940 and 1941.

Tons of cane ground	Number of mills	Costs per 100 pounds of raw sugar					
		Total	General overhead	Procurement of cane	Manufacture of sugar	Selling	Interest
1939—Under 50,000...	10	$ 3.30	$ .30	$ 1.89	$ .59	$ .19	$ .11
50,000 to 74,999.	12	3.03	.31	1.87	.54	.18	.13
75,000 to 99,999.	13	2.94	.30	1.83	.54	.14	.13
100,000 and over.	7	2.89	.36	1.81	.48	.12	.12
All mills...	42	2.95	.32	1.83	.52	.15	.13
1940—Under 30,000...	9	3.58	.53	1.90	.81	.14	.20
30,000 to 49,999.	17	3.50	.47	1.92	.76	.12	.23
50,000 and over.	12	3.49	.48	1.92	.74	.09	.26
All mills...	38	3.52	.49	1.92	.76	.11	.24
1941—Under 50,000...	14	4.07	.40	2.66	.69	.13	.19
50,000 to 74,999.	12	3.79	.32	2.54	.65	.09	.19
75,000 and over.	10	3.63	.46	2.27	.63	.07	.20
All mills...	36	3.79	.42	2.46	.65	.09	.19

and the cost per 100 pounds of sugar manufactured. For each of the three years the total costs declined as the number of tons of cane ground increased. In 1939 the difference in total cost between the mills grinding the smallest number of tons and those grinding the largest amounted to 19 cents per 100 pounds of sugar. This is equal to 6.2 per cent of the cost incurred by the small tonnage mills. In 1940 the difference was only 9 cents per 100 pounds of sugar or 2.5 per cent, while in 1941 the figures were 44 cents and 10.8 per cent.

Most of the reduction in unit costs with increased tonnages occurred in the selling costs and in the costs of manufacturing. Interest costs were practically constant regardless of the amount of cane ground in 1939 and 1941. In 1940 interest costs per 100 pounds of sugar increased as the tonnage ground increased. Apparently for most years the investment in a sugar mill increases about in proportion to the tonnage of cane handled, but in 1940 with a short crop the investment per ton was higher for the mills that handled the most cane.

TABLE 7. Relation Between the Volume of Cane Ground and the Income Per 100 Pounds of Sugar Manufactured by Mills in Louisiana, 1939, 1940 and 1941

Tons of cane ground	Number of mills	Income per 100 pounds of raw sugar				
		Total receipts	Receipts from sugar	Other receipts	Net operating income	Net income
1939—Under 50,000	10	$ 3.14	$ 2.85	$ .29	$ .17	$ .06
50,000 to 74,999	12	3.13	2.87	.26	.23	.10
75,000 to 99,999	13	3.09	2.85	.27	.28	.15
100,000 and over	7	3.25	2.98	.27	.48	.36
All mills	42	3.13	2.87	.26	.31	.18
1940—Under 30,000	9	3.31	3.03	.28	−.07	−.27
30,000 to 49,999	17	3.28	2.92	.36	.01	−.22
50,000 and over	12	3.29	2.94	.35	.06	−.20
All mills	38	3.30	2.95	.35	.02	−.22
1941—Under 50,000	14	4.23	3.32	.91	.35	.16
50,000 to 74,999	12	4.40	3.50	.90	.80	.61
75,000 and over	10	4.04	2.81	1.23	.61	.41
All mills	36	4.21	3.17	1.04	.61	.42

The net income of the sugar mills increased, or the losses declined, each year as the amount of cane ground increased (Table 7). In 1939 the difference in net income between the mills with the lowest tonnage and those with the highest amounted to 30 cents per 100 pounds of sugar, in 1941 it was 25 cents, while in 1940 the losses were 7 cents lower for the large tonnage mills. These differences are large enough to be of

great importance to the financial prosperity of a mill, especially since the same mills are likely to handle small or large tonnages year after year.

In each of the three years the mills which ground the largest amount of cane had a slightly longer operating season than did the mills with the smallest tonnages (Table 8). In 1939 the difference amounted to 7.3 days which is equivalent to a 14.4 per cent increase in the length of time the small tonnage mills operated. In 1940 the differences amounted to 9.8 days or 39.0 per cent and in 1941 to 6.4 days or 15.8 per cent. The short grinding season, which causes the investment in sugar mills to be idle most of the year, has always constituted an unfavorable condition for the Louisiana sugar industry as compared with similar industries in the tropics. Apparently some of the mills have succeeded better than others is lengthening their grinding season somewhat. Usually these have been the mills with the largest grinding capacity, and also those with the lowest unit costs and largest net incomes.

TABLE 8. The Relation Between the Volume of Cane Ground and the Average Amount of Sugar and Technical Efficiency of Louisiana Sugar Mills, 1939, 1940 and 1941.

Tons of cane ground	Number of mills	Pounds of raw sugar made	Days of capacity grinding	Capacity of mills in tons per 24 hours	Pounds of raw sugar per ton of cane	Per cent of sucrose recovered in sugar
1939—Under 50,000	10	6,731,073	50.7	795	167.1	77.3
50,000 to 74,999	12	10,935,943	54.2	1,179	171.2	77.4
75,000 to 99,999	13	14,619,021	58.5	1,413	176.7	80.2
100,000 and over	7	21,991,235	58.0	2,129	178.0	82.5
All mills	42	12,917,332	56.1	1,319	174.5	79.7
1940—Under 30,000	7	3,885,706	25.1	943	164.1	80.1
30,000 to 49,999	13	6,451,900	31.1	1,288	160.9	78.0
50,000 and over	12	10,879,377	34.9	1,900	164.1	79.3
All mills	32	7,550,849	32.1	1,442	163.0	78.9
1941—Under 50,000	14	6,497,053	40.5	964	166.4	80.4
50,000 to 74,999	12	10,693,507	46.2	1,380	167.5	80.4
75,000 and over	10	15,926,585	46.9	1,995	170.2	81.5
All mills	36	10,487,407	45.0	1,390	167.9	80.9

The number of pounds of raw sugar obtained per ton of cane ground was larger for the large tonnage mills than it was for the other mills, in both 1939 and 1941. In 1940 there was very little difference except that the yield was lowest for the median group of mills. There appears to be some relationship between the yield of sugar obtained and the proportion of the total sucrose in the cane which was recovered in the form of sugar. This percentage was higher for the large tonnage mills

than for those with small tonnages, except in 1940. Variations in the yield of sugar per ton of cane are affected by the technical efficiency of the mills and by the sucrose content of the cane ground. Apparently the mills with the larger tonnages were usually the most efficient in extracting sugar. Although the data are not shown in Table 8, there were only slight differences in the sucrose content of the cane ground by the various groups of mills.

Relation of Yield of Sugar to Financial Results

The number of pounds of sugar obtained per ton of cane ground has always been an important factor influencing the financial success of a sugar mill. Table 9 shows the relationship between the yield of sugar and the costs per 100 pounds of sugar manufactured. In each of the three years there was a general tendency for the costs to decline as the number of pounds of sugar obtained from a ton of cane increased. The relationship was somewhat irregular, especially in 1940, but the mills with the highest yields always had lower costs than did those with the lowest yields.

TABLE 9. Relation Between the Yield of Sugar Obtained Per Ton of Cane and the Average Costs, Per 100 Pounds of Raw Sugar Manufactured, of Operating Sugar Mills in Louisiana, 1939, 1940 and 1941

Pounds of raw sugar per ton of cane	Number of mills	Costs per 100 pounds of raw sugar					
		Total cost	General overhead	Procurement of cane	Manufacture of sugar	Selling	Interest
1939—Under 150	2	$ 3.72	$ .38	$ 2.15	$ .70	$ .32	$ .17
150 to 159.9	0	....	....	....	....	....	....
160 to 169.9	15	3.10	.32	1.94	.55	.17	.12
170 to 179.9	15	2.93	.34	1.75	.56	.15	.13
180 and over	10	2.75	.27	1.80	.44	.11	.13
All mills	42	2.95	.32	1.83	.52	.15	.13
1940—Under 150	4	3.91	.53	2.15	.80	.10	.33
150 to 159.9	9	4.06	.57	2.21	.93	.10	.25
160 to 169.9	19	3.43	.46	1.88	.79	.09	.21
170 to 179.9	3	3.17	.38	1.85	.65	.15	.14
180 and over	3	3.49	.57	1.83	.54	.20	.35
All mills	38	3.52	.49	1.92	.76	.11	.24
1941—Under 160	5	4.14	.36	2.67	.73	.18	.20
160 to 169.9	18	3.65	.39	2.43	.60	.06	.17
170 and over	13	3.85	.41	2.43	.70	.10	.21
All mills	36	3.79	.40	2.46	.65	.09	.19

The principal reductions in cost which accompanied an increased yield of sugar were in the manufacturing costs and the costs of pro-

curing cane. The price which mills pay for cane varies according to its sugar content and probably was somewhat higher per ton for the mills with the higher yields of sugar than for those with lower yields. However, this difference was not enough to entirely offset the influence of the larger number of pounds of sugar obtained, so that costs per 100 pounds still decreased as sugar yields increased. The decreasing costs of manufacture with increasing yields was probably the result of greater technical efficiency in the operation of the larger mills which were the ones obtaining the higher yields.

TABLE 10. Relation Between the Yield Obtained Per Ton of Cane and The Income Per 100 Pounds of Raw Sugar Manufactured by Mills in Louisiana, 1939, 1940, and 1941.

Pounds of raw sugar per ton of cane	Number of mills	Income per 100 pounds of raw sugar				
		Total receipts	Receipts from sugar	Other receipts	Net operating income	Net income
1939—Under 150	2	$ 3.51	$ 2.99	$ .52	$ −.04	$ −.21
150 to 159.9	0	....	....	....	....	....
160 to 169.9	15	3.22	2.91	.31	.24	.12
170 to 179.9	15	3.08	2.84	.24	.28	.15
180 and over	10	3.08	2.88	.21	.46	.34
All mills	42	3.13	2.87	.26	.31	.18
1940—Under 150	4	3.50	2.86	.64	−.09	−.41
150 to 159.9	9	3.67	3.33	.34	−.14	−.39
160 to 169.9	19	3.26	2.92	.34	.04	−.17
170 to 179.9	3	3.20	2.98	.22	.17	.03
180 and over	3	3.44	3.18	.26	.30	−.05
All mills	38	3.30	2.95	.35	.02	−.22
1941—Under 160	5	4.46	3.24	1.22	.52	.32
160 to 169.9	18	4.24	3.04	1.20	.76	.59
170 and over	13	4.09	3.29	.80	.45	.24
All mills	36	4.21	3.17	1.04	.61	.42

Both the net income and the net operating income per 100 pounds of sugar was larger for the mills with a high yield of sugar than it was for those with a low yield (Table 10). This relationship was very consistent between the different groups of mills in 1939 and 1940. However, in 1941 the mills with the highest yields did not have the highest net income. This was largely caused by the fact that the "other receipts" per 100 pounds of sugar, which includes receipts from the sale of molasses rose very rapidly during the early part of the season and mills obtained widely varying prices for their molasses depending upon the time of sale.

The relationship between net income and yield of sugar was very largely determined by the relationship between cost and yield. There

was no consistent relationship between the receipts of the mills and the yield of sugar which they obtained, although there was considerable variation between the groups each year.

In 1939 and 1941 the mills with the highest yield of sugar were those with the largest grinding capacity and also those which produced the largest total number of pounds of sugar. In 1940, when the cane crop was unusually poor, the relationship between yield and size was inconsistent for the various groups of mills (Table 11).

TABLE 11. The Relation Between the Yield of Sugar and the Average Volume of Business, Capacity and Technical Efficiency of Louisiana Sugar Mills, 1939, 1940 and 1941.

Pounds of raw sugar per ton of cane	Number of mills	Pounds of raw sugar made	Tons of cane ground	Capacity mills in tons per 24 hours	Days of capacity grinding	Per cent sucrose in cane	Per cent of sucrose recovered in sugar
1939—Under 150.....	2	6,637,188	48,188	850	56.7	9.6	67.2
150 to 159.9....	0	.....	.....	.....	....	.....	....
160 to 169.9....	15	11,191,768	68,076	1,247	54.6	10.1	77.6
170 to 179.9....	15	14,197,065	79,424	1,413	56.2	10.4	80.6
180 and over....	10	14,842,109	80,032	1,378	58.1	10.7	82.5
All mills...	42	12,917,332	74,028	1,318	56.1	10.4	79.7
1940—Under 150.....	3	8,635,864	58,617	1,567	37.4	9.9	71.3
150 to 159.9....	9	7,030,155	44,847	1,378	32.6	9.6	77.8
160 to 169.9....	17	7,052,203	42,571	1,397	30.5	9.8	80.3
170 to 179.9....	0	.....	.....	.....	....	....	....
180 and over....	3	10,853,471	59,419	1,767	33.8	10.5	83.1
All mills...	32	7,550,849	46,326	1,442	32.1	9.8	78.9
1941—Under 160.....	5	8,305,027	53,925	1,230	43.8	9.8	78.1
160 to 169.9....	18	10,284,776	62,119	1,319	47.1	9.5	80.7
170 and over....	13	11,531,198	66,204	1,548	42.8	10.3	81.9
All mills...	36	10,487,407	62,456	1,390	45.0	9.9	80.9

The relatively low yields obtained by the small mills seem to have been partly the result of grinding cane containing a slightly smaller percentage of sucrose than that ground by the mills obtaining higher yields. This was true in each of the three years if the comparison is made between the group of mills with the lowest and the group with the highest yields. However, the relationship was not consistent for the middle groups of mills except in 1939.

A more important factor favoring high yields of sugar was the better extraction obtained by the larger mills. In 1939 the proportion of the sucrose present in the cane which was recovered in sugar varied from 67.2 per cent to 82.5 per cent. In the other years the variation was less but

still large enough to be significant. For instance, in 1939 the difference between the lowest and highest groups in the per cent of sucrose recovered was equivalent to 26.6 pounds of 96° sugar per ton of cane. In 1940 the difference was equivalent to 22.2 pounds and in 1941 to 5.8 pounds.

SUMMARY

A study of the financial results obtained from the operation of Louisiana sugar mills during the three-year period 1939 to 1941 shows that expenses and profits have varied widely. An unusually short crop of cane for grinding in 1940 was the most important cause of the high expenses per unit of product and the sizeable losses sustained by the mills that year. Unit costs were even higher in 1941 than in 1940. However, this was primarily the result of a higher price paid for cane and under the terms of the Louisiana cane purchase contract the price of cane varies directly with the price of sugar. Consequently the mills, in 1941, received enough for their sugar to enable them to meet their high expenses and still have some profit.

Various factors appeared to be more or less closely related to the variations in costs and returns which existed each year between different sugar mills. For instance, the mills in the Teche region had the lower unit costs and higher net incomes in 1939 and 1940 than did those in the Mississippi region. In 1941, this situation was reversed.

The size of a sugar mill and the volume of cane which it grinds are directly related to unit costs and returns. In general costs per unit of product were lower for the larger than they were for the smaller mills, although this was not true in 1940 when the tonnage of cane ground was unusually small for all sizes of mills. These lower costs seem to have been partly the result of greater technical efficiency in extracting sucrose from sugar cane. However, a considerable part of the difference appears to be the result of a more effective use of labor and materials in manufacturing and selling sugar. This is shown by the consistent decline in these costs as the size of the mills increased.

The number of tons of cane ground by a mill is closely related to its grinding capacity but is not entirely controlled by this factor, since some mills operate for a longer season or more nearly at their maximum capacity than do others. During each of the three years 1939 to 1941, the mills grinding the largest tonnage of cane had more days of capacity grinding than did the mills with small tonnages. They were also the mills with the largest grinding capacity and the highest percentage recovery of sucrose. In general the greater amount of cane ground the lower were the costs per 100 pounds of sugar manufactured and the higher the net income received.

Each year certain mills obtained a considerably larger number of pounds of sugar per ton of sugar cane ground than did other mills. These

differences were the result of grinding cane with a higher sucrose content and of obtaining a better recovery of sucrose in the form of sugar. In general, the difference in the percentage of the sucrose in cane which was recovered in sugar was a more important factor than the difference in the original sucrose content of the cane. There was a significant tendency for the costs per 100 pounds of sugar manufactured to be lower and net incomes higher for those mills which obtained a high yield of sugar than they were for mills with lower yields.